Drone technology: enhancing potato trials analysis

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Drone Technology:
Enhancing potato trials analysis

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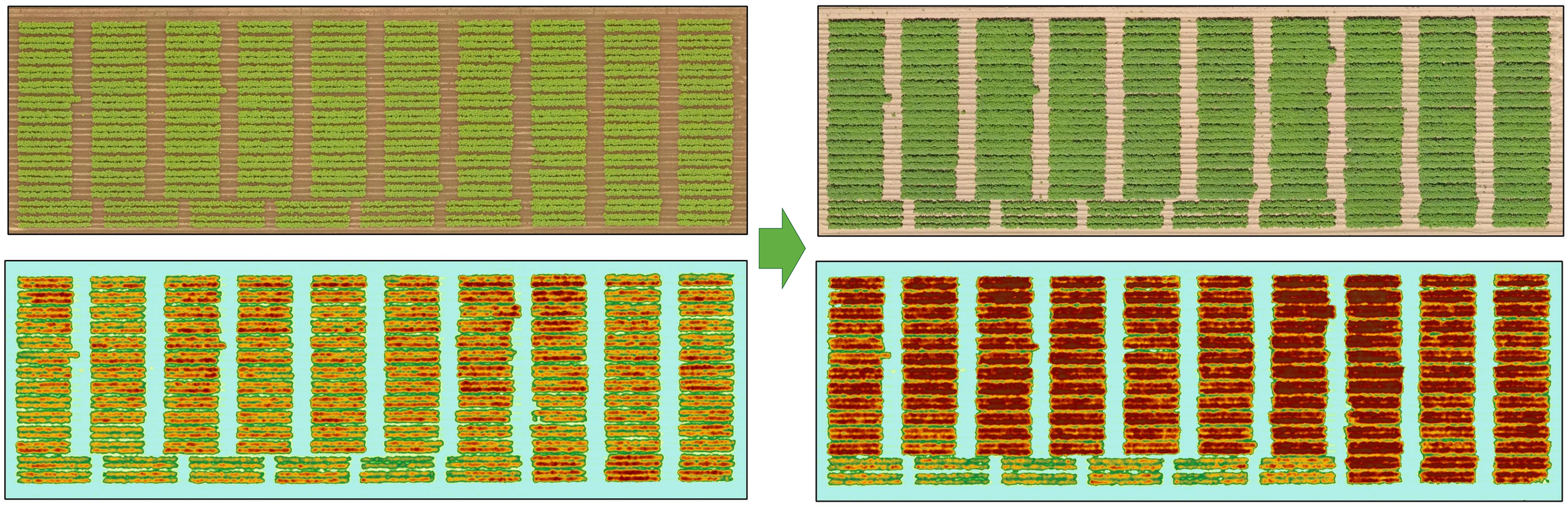
An introduction into drones and their uses

Drones have become useful and affordable research tools that show great promise for a variety of precision agriculture applications due to the unique aerial perspective they can provide. When used to create imagery of potato trials, commercially available "ready to fly" drones can provide detailed images of the development of each plot over the growing season, building up a historical record of each trial. This information complements existing ground based assessment, enhancing the details recorded for each plot on the ground, as both visual information and canopy height data can be captured when processed using specialist software.

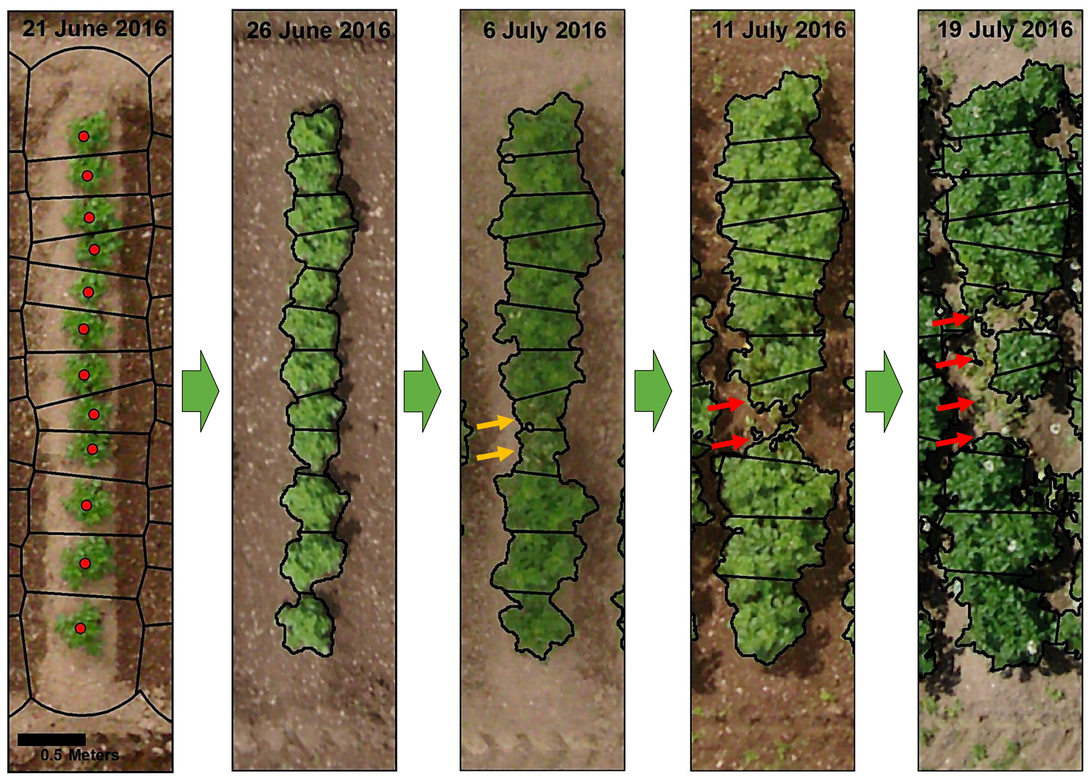


The images above and to the left show a view of the canopy and its height for part of a PCN trial captured on the 9th July 2018. On the right, the same trial plots on the 18th July 2018, where canopy development is leading to intra-row closure and a large increase in canopy height (with the longer plots towards the bottom left of the trial showing slower development).

Trials analysis and disease detection

At SRUC we have been testing the use of drones for trials analysis over the last few years and are developing new ways to record details of each plot. As, rather than record just at the plot level, we can now go down to the plant level, tracking the growth of each individual plant from emergence, allowing the full variance per plot to be seen. Tracking the development of each plant also allows the possibility of mapping the onset of disease, with some investigative work already carried out looking at the early detection of blackleg disease.

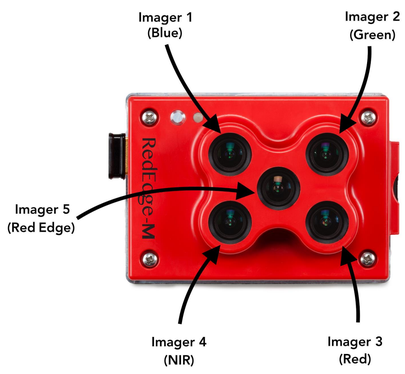
The image to the right shows the development of blackleg though a row of potatoes. The red dots indicate the emergence points and the black borders are the growth spaces allocated to each plant. On the 6th July disease is detected for two plants as they are showing reduced canopy growth and lower than average canopy height compared to the other plants in the trial (orange arrows). Those plants start to die back on the 11th July, with some neighbouring plants also showing signs of blackleg infection on the 19th July (red arrows).



Into the future with multi-spectral analysis

Over the 2018 growing season we have also been experimenting with drones carrying multi-spectral sensors (cameras that can see beyond the visual spectrum of light), to see what further benefits can be obtained from this upcoming technology. When combined with plant growth modelling, these sensors have the potential to provide further information on the onset of disease or other stresses such as water deficiency. They should also aid in the identification of the current nitrogen content of each plant, leading to the possibility of varying the rate of nitrogen input required (thereby reducing costs), as well as providing an indicator for expected yield and potentially tuber size.

The image to the right shows an example of the type of multi-spectral sensor currently being using at SRUC. Miniaturised multi-spectral sensors that are specifically designed for drones and geared towards agriculture are now becoming increasingly available.



The image to the right shows a typical vegetation response to stress. The extra information obtained when monitoring plants using non-visual wavelengths of light will enhance the abilities of plant growth modelling, so multi-spectral sensors are likely to be key agricultural tools in the future.